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THE STONE HAMMER AND ITS VARIOUS USES.

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A comparison of stone implements, wherever found, reveals great similarity in them, not only in shape, but also in the method of their manufacture. Local peculiarities, it is true, are often to be observed, but as a rule they are more often due to material than to shape or finish. If we except the Government publications on archæology, and Evans' Ancient Stone Implements of Great Britain, works relating to this subject are, generally speaking, poorly illustrated; outlines are well executed, but the character of work on the implements does not appear to be considered of importance, and as a rule is inadequately shown. In referring to what has been written on the subject I have often been forced, in interpreting the text, to rely on inferior delineations. Moreover, there is often a lack of sufficient information regarding the proportion of the figures to the implements illustrated.

Through the courtesy of the officers of the National Museum I have been enabled to examine a collection of implements from different parts of the world for the purpose of endeavoring to demonstrate the probable function of one implement which appears to have been put to a use different from any heretofore assigned to it, and to be found over a wider range of territory than has been generally understood. There are many kinds of stone hammers, and they are of many sizes—from that of a walnut to the large mauls used in quarries, which were often heavier than a single individual could readily manage. The hand hammer, familiar to all, was probably the tool upon which races living in the stone age relied more than upon any other object to fashion other stone implements. Figure 1 is a typical hammer of

quartzite from McMinn county, Tennessee, the periphery of which is pitted by use, and the flattened sides show that it has been used as a rubbing stone as well; for not only did the savage rely on the hammer to peck an axe or celt into shape, but it was also used for rubbing or polishing the implement after it had been shaped.

There is no implement more common among the relics of the stone age, none the uses of which have been less discussed by archæologists, and none more deserving of thorough discussion.

An examination of these objects will demonstrate that three types probably contain them all.

First. The oblong or flattened ellipsoid having a pit on one or both sides; the pits probably being intended as finger-holds to relieve the index finger from the constant jar occasioned by quickly repeated blows on a hard surface. The periphery of these will often be found quite smooth, at other times rough, according as it has been last used as a hammer or as a rubber, although hammers of hard and tough material, when used on stone of similar character, wear away on the periphery as though rubbed. Often one or both of the flattened sides show the effect of rubbing, as in Figure 1.

Second. The spherical implement slightly flattened at the poles, showing a battered and commonly a smooth surface. These two types may be considered as common all over the world.

The third type would appear to be the grooved hammer, of the use and distribution of which is less known. This type was evidently intended for hafting, which would interfere with its use as a rubber.

All three types vary greatly in dimensions, but as a rule the two first are of a size suitable for hand use, not only for hammering but also for rubbing.

It is intended to discuss here the hammer used in stone pecking as distinguished from the chipping hammer. By the latter a slower and more deliberate blow would be given, and consequently its shape would not be material.

That nuts and bones could be cracked and paint and grain could be ground with hammers is admitted, but it is contended that no reasonable amount of such work would cause the implements to present the appearance they do if only so used. Moreover, any unshaped stone would have answered these purposes as well as a finished implement; hence, is it reasonable to suppose that savage man would trouble himself to fashion useless objects?

Hammers were made of any hard stone that could be obtained. It is common to find them of diorite, quartzite, or other tough

material capable of the greatest amount of work with the least wear; they would be gritty, as is almost invariably the case, to grind the pecked surface as work progressed. It can hardly be doubted that men living in an age of stone must have been conversant not only with the best sources of material, but also with its adaptability for particular uses.

As some may doubt whether the stone hammer could do the work suggested, a specimen is shown in Figure 2. It is made of a close-grained black porphyry that in 1878 was pecked out and grooved entirely with a stone hammer by the writer as a first effort to demonstrate the method of axe-grooving. The work on this stone represents approximately five hours' labor. When the hardness of material is taken into consideration, it is safe to conclude that it could not have taken more than one-half as much time to groove an ordinary axe, since they are of much softer material. From this may roughly be calculated the time that would be required to fashion a stone axe or in fact any other stone implement which was made by pecking and polishing; and it will be seen that, granting a liberal allowance of time, the manufacture of stone implements consumed a small portion of the time supposed to be requisite. The statement that the manufacture of an axe or in fact of any other stone implement was a long process has so often been made that it may be regarded as a common belief among archæologists. So great have the difficulties of their manufacture been supposed to be that it has been surmised even that early races had other than stone tools. Among the well known authors who have suggested one or the other of the above ideas may be cited, Evans, Dawson, Bancroft, Lubbock, Southall, Schliemann, Wilde, Kellar, and Wilson, of Scotland; yet all of them must have been familiar with the hand hammer, which is common wherever stone implements are found, as will be shown; and many of the above named authors furnish illustrations of hammers, though they usually call them by other names. Others describe the hammers as objects of unknown uses, or attribute to them uses other than pecking. Jones, author of "Antiquities of the Southern Indians," suggested that they are nut-crackers, and Dr. Rau concurred with him. Stevens in "Flint Chips" suggests their use for flaking by percussion, with which view Nillson appears to agree. Sir John Lubbock doubts whether they really belong to the stone age.

The pecked surface of implements, which differs so greatly from the grooved and polished surface of those made of flint, does not

appear to have been adverted to by more than one or two authors, and the origin of the pecked surface appears to have been left unexplained. In the collection of the National Museum are celts, both pecked and polished, from Sweden, Denmark, France, Switzerland, England, Ireland, Greece, the United States, Central America, the West Indies, Mexico, Brazil, Sandwich Islands, New South Wales, New Zealand, Japan, and India; all of them show the marks of the stone hammer. Figure 3 is a rudely pecked celt of indurated clay slate from Bradley county, Tennessee, the whole surface of which is pecked. Figure 4 is a diorite celt from Yverdon, Lake Neuchâtel, the blade of which is ground, but the rest of the implement shows clearly the pecking process. These two implements may be taken as fair types of stone-hammer work, the one in its rough and the other in its more complete stage.

Schliemann found celts at Tiryns and Mycenæ, and at Hissarlik more than 500 were discovered. Judging from the photographs of these objects as they are presented in "Trojanische Alterthume," they were evidently pecked into shape with stone hammers, of which he found thousands in the four lower cities of Troy.

Dr. C. C. Abbott, in "Primitive Industry," says hammers are supposed to have been used for pecking axes and celts, and also mentions them as rubbers, but appears to think they would readily be broken, and that it would be vain to attempt to determine the particular purpose of all hammers.

The material of which hammers are made varies greatly in hardness, and it would naturally be selected with reference to the particular stone to be worked. In forty-odd hours' work a jasper hammer, in the hands of the writer, showed little wear, although the material upon which it was used was nephrite—one of the toughest of known stones. Quartzite varies in texture. Some of it is almost as soft as sandstone, and again it is almost as hard as jasper. The hammer of hard quartzite is hard enough to fashion a number of almost any sort of implements found on the Atlantic seaboard.

The supposition that a great length of time was necessary to fashion a stone implement gained a certain credence probably from a passage in Lafitau's "Mœurs des Sauages Ameriquains," Paris, 1724. "Hatchets," he says, "have been used over the whole of America from time immemorial. They are made of a pebble hard and difficult to break. They require a great deal of time to make them serviceable. The manner of preparing them is to sharpen them by rubbing them on a sandstone, and to give them, by means of time

and work, very much the appearance of our hatchets, or of a wedge. Often the life of a savage was not sufficient for this purpose, from which it comes that such an article, though rough and imperfect, is a precious heritage to their children."

A large proportion of the Indian tribes were living in a state of savagery at the date of Lafitau's work in America, but the French had occupied a large portion of Canada one hundred years before, and metal must have generally supplanted stone for tools prior to the time of Lafitau. Iron axes and hatchets would have great value to an Indian possessed only of those of stone, and the trade in iron implements must have spread over vast distances. John Smith found at the head of Chesapeake bay, in 1608, articles of European manufacture, which he supposed had come into the Indians' possession by trade with settlers on the St. Lawrence. Lescarbot in 1618 describes the Canadian Indians as being indolent and idle, except in regard to hunting. Lafitau goes further and says of the natives, "Idleness, indolence, and laziness was at the bottom of their character," and he adds that "they passed their time with arms crossed, doing nothing except singing, dancing, and attending their assemblies." These descriptions agree better with the generally received opinion of savage character than those which attribute to an individual of the stone age the patience of a Chinese ivory carver, or even of those more advanced races who first wrought sculptures in hard stone. Captain Cook in his voyage to the Pacific found the aborigines living in a pure age of stone, and traded metal extensively with them; yet upon his return, only two years later, he found that stone tools, which were common at the time of his first visit, had almost entirely disappeared from use and were difficult to obtain. Lafitau's remarks in regard to the length of time necessary for the fashioning of stone implements were evidently made carelessly and in ignorance of the facts, for the necessaries of life were too difficult to obtain to permit a lifetime, a year, a season, or even a month, to be spent in fashioning a hatchet that might be lost or broken by the first careless blow.

One of the best-known implements found in Europe is the bored hammer, called also Thor-hammer, axe-hammer, or Danish hammer. Concerning the external shaping of this implement no suggestions appear to have been made. They are often found roughly pecked into shape, of great symmetry, and are almost invariably bored; frequently, however, they are perfectly smoothed or polished as a celt. Figure 5 is of diorit efrom Sweden, and shows the same char-

acter of work as appears on Figure 3. The whole surface and the hole for the handle has been pecked, yet the method of fashioning these implements has been declared to be inexplicable. Similar objects have been described from the United States, but they must be very rare. They are seldom, if ever, found of flint.

The workmanship of the chipped flint of Europe differs from that of the Thor-hammer and celt of tougher material. Flint implements are almost, if not invariably, chipped or ground; usually both chipped and ground. Flint has a conchoidal fracture, is easily worked, and may be readily chipped into almost any shape. If battered with a hammer, flint will fracture straight through and the implement will be ruined. Figure 6 illustrates a celt of flint from Jutland, Denmark, and exhibits very perfectly the chipping and grinding process by which flint implements were usually worked. Sir John Lubbock, Nillson, Tyler, and Southall attribute the Danish hammer to the age of metal, and the suggestion has been advanced that the hole has been bored with tools of bronze. Though in the two lower cities at Hissarlik, Schliemann found no bronze, he discovered these hammer axes. Their points often present a battered appearance, as though they were used in hammering stone. The heavier class of stone implements, upon a careful examination, will be found to present (flint excepted) a pecked or battered surface, although instances are not uncommon when the hammer marks have been almost, if not entirely, ground away and the surface polished. The blades and thin edges of implements were ground, since blows upon the thin edge would likely fracture it. Figure 7 is a grooved axe of water-worn pebble from Northumberland county, Pennsylvania, showing the natural surface of the pebble, with the groove and part of the implement pecked into shape.

The character of work observable on this class of stone implements is the same all over the world. Whether the objects are from the ruins of Greece or the village sites of America; from the lake dwellings of Switzerland, Ireland, or Scotland; whether it be the axe-hammer of Scandinavia or the celt from New Zealand, Japan, or India; the statues of Central America and Mexico or the sculptures of ancient Egypt and Greece—all present the same characteristic pit-marks, the origin of which has heretofore not been satisfactorily explained. This origin may be explained readily on the supposition that they were made by the hand hammer of stone. It has been suggested that man possessed tools made of a copper alloy with which the stone objects in question might have been fashioned,

but no such tools appear to have been found. Another suggestion is that the pit-marks were produced by a sharp-pointed stone tool. If so, scratches would be left on soft material, and a hard surface would break the tool. On the other hand, the stone hammer is capable of such work (Figure 2), has actually done it, and moreover is commonly found wherever stone implements are met with. It may be confidently asserted, for instance, that the hand hammer will be found wherever archaic sculpture is discovered, as was the case at Mycenæ. That no special notice of such tools appears in connection with these finds can only be explained, as at Mycenæ, on the ground that excavators have considered the hand hammer as pertaining rather to the domestic economy of the ancients than to the work of sculpture. At Hissarlik, where Schliemann excavated 52½ feet to bed-rock, he describes seven strata, each stratum being occupied by a separate city. Admitting that the accumulation of débris in ancient times was greater than at present, a vast number of years must have elapsed from the date when the first town was settled until the uppermost site was finally abandoned. Objects found at Hissarlik or Troy appear to demonstrate that man, living in the two lower strata was in the very early part of the age of metal, if not in the pure age of stone; yet stone hammers were found in the four lower strata by thousands. Even in the fifth city celts were found, but no axe-hammers. Schliemann describes a grooved hammer, not unlike Figure 2, found only six feet below the surface. This would place it only at the bottom of the seventh city.

Celts were commonly polished, were always graceful in outline, and would naturally be preserved. The hammer is homely at best and is less sought for by collectors; but from an archæological standpoint the hammer tells us more of ancient times than does the celt. It appears singular that archæological authors, as a rule, have paid so little attention to this implement.

The hammer here shown from the third city of Troy, the one from Arizona, as well as those from Switzerland and South Carolina, all evidence by their shape and battered edges that the use of the implement was similar wherever it was met with. It being shown, as in Figure 2, that the pitted appearance on stone implements can be produced by the use of the stone hammer and is not to be distinguished from the work on celts, axes, etc., the only inference permissible is that the methods of manufacture were in all cases the same.

In works on archæology the hammer has received many names, and as many different uses, other than that of a fashioning tool,

have been attributed to it. The process of its manufacture has also been variously explained. Among some of the names given by writers to this implement are the following: Disc-hammer, hand hammer, chipping-hammer, nut-cracker, milling-stone, grain-bruiser, corn-crusher, mealing-stone, oval-tool stone. Others have included it among the discoidal stones. One says all hammers are bored. Another would call implements of this class hammers if they are not bored. Another thinks the hammer was intended for driving wedges or chisels. Some consider that the pits on the flat surface were made with a punch or chisel. One says the use of the tool is unknown. It is attributed also to the age of metal. Some authors do not apparently consider the stone hammer worth describing. Mansfield Parkyus, in "Life in Abyssinia," says the natives smoothed a grinding stone by pecking with a pebble, which was long and tedious, but produced a tolerably smooth surface.

Whether the author is right or wrong in the suggestion as to the use of this implement as a pecking stone, it must be admitted that the hand hammer is an implement the name, age, and uses of which are a subject which has caused a great diversity of opinion. Found alike in the caves of England and the continent, in the lake dwellings of Europe, in the dolmens, in the lowest strata of Troy, or on the village sites of recent savage races, it may be considered a universal tool, used by man through all ages—a cutting and probably a polishing tool as well.

The celt or axe, as well as the pestle and the beautiful discoidal or hammer stones, may be pecked into shape by means of the hand hammer, and its use is apparent on more than one stone pipe; the same pecking-marks are visible on the statuary and carvings of America and Greece and Egypt. When surfaces were to be cut the hammer sufficed for the work, even were the stone so hard that a steel tool would have been useless. A vast majority of the heavier stone objects present evidence of the peculiar work of the hammer—possess grooves and have few if any angles. The same implement after being used to shape the stone would smooth and even polish its surface. Copper was employed by the American Indians as a stone. Being malleable, it was battered into shape, and all early travellers on this continent found it common among the Indians. It may even have been used on very soft stones as a cutting tool.

The stone hammer of the middle Atlantic coast appears most commonly to have been made on a tough, compact and fine-grained

quartzite. Though softer stones were used, doubtless, when soft material was to be worked, jasper, which will work any stone of which implements were made, was probably also employed. The wear on the hammer depends largely upon the material worked, and in selecting the hammer, it may naturally be supposed the workman would consider this.

The writer began the study of this subject in an effort to demonstrate the manufacturing of a grooved-stone axe. It was then observed that the surface marks of the celt and the discoidal stones indicate a similar method. The ceremonial implements also, and even certain of the bird pipes, presented a similar class of work. Finally an examination of the collection of the National Museum was made, and it was observed that the Mexican and Central American carving presented the same surface indications, allowing for difference of material, as the celt and axe. There appeared to be but one inference, and that was that the process of manufacture was similar, and that the tool was the same in each instance. The hammer was the only tool known to the writer that would produce such results, and experiment has shown that the hammer could produce them.

To return to the process employed by the ancient sculptor: In the National Museum there are but few statues, and they are from Central America. A careful examination of these objects reveals the same pecked surfaces observable on celts and other small implements. All the work on these sculptures could readily be done with the stone hammer. The material of the sculpture is a volcanic tufa, and had an implement like the chisel been used it is submitted that lines would be visible indicating the employment. Such is not the case, for pecking only appears on them.

Egyptian sculpture of the earlier dynasties also seems to show the same character of pecking that is visible on the sculptures of America. In both classes angles are quite unusual, while curved lines and grooves are frequent. The same may be said of ancient Greek sculpture. If man has gradually advanced from a very low stage, and the hammer can be shown to have been the fashioning tool of early man, would not it remain so until a superior material became available? The engraving of the tablets found at Mycenæ, as illustrated in Schliemann's work, appear to indicate also the same general character of work as is seen on the Central American sculptures. As appears from the pit-marks on the surfaces, the furrows are all curves—in fact, every detail of manufacture can be explained on the theory that they were made by the stone hammer, numbers of

which were there found. Going further than this, however, it can be shown that the early Egyptian sculpture, probably as recent as the 20th dynasty, was more likely produced by means of the hand hammer than with any other implement, notwithstanding the theory of Mr. Emil Soldi, president of the section of the history of art of the Numismatic and Archæological Society, in his work "La Sculpture Egyptienne," Paris, 1876, who claims that iron and steel were the implements of ancient Egyptian sculpture. He says we are reduced to hypothesis concerning processes employed by artists of the Nile, and causes which have impressed on its sculpture its general character, that savants have attributed fabulous methods far from the real facts; that the explanation of the Egyptians working the hardest materials—granite, basalt, and diorite—was due to youthful determination in them as a nation; it was principally these materials, he says, which accounted for their sculptures being so impressive and remaining of an architectural character. Material and process had immense influence on art. Egyptologists have imagined peculiar processes of sculpture, but he imagines methods similar to those of the present time, and suggests the pointing tool as the implement used not only to cut and reduce the block, but to fashion the hair and produce the broken and irregular lines apparent on the sculptures of the Louvre. He further suggests the marteline or double-edged pick or hatchet as of frequent use in Egypt, and remarks that there are no evidences of the use of the chisel at an early date, and calls attention to the rose granite sphinx of the Louvre, and says the polish has not worn away nor the fractures of the point which did the modeling. He says Mr. Wilkinson claimed the Egyptians did their work with a bronze chisel—one of which was found in a quarry of soft Theban stone. Mr. Soldi claims that the work was done with iron or tempered steel. Iron, he says, was known to the Egyptians, and he accounts for its disappearance by the presence of nitre in the soil. He shows that elegance and grace first appeared in the statuary of the 26th dynasty, and that a peculiarity of the ancient design which represented the four fingers of the hand of equal length, divided longitudinally by striæ. In Mr. Soldi's work are presented two engravings of Theban painting, the one representing a sphinx, the other the statue of a man, in each of which are individuals polishing the sculptures with discs; there also appear figures with objects in their hands, with which they seem to be hammering the figures. These illustrations are referred to as having peculiar significance in considering the question

of the use of the hand hammer in carving. There is nothing in Mr. Soldi's argument that will not apply with equal force to the small Mexican statue illustrated here. Upon it may be seen similar pit-marks, and the work is of the character he describes. The head has been broken off the neck of this figure, which is unfinished; the pecking is as plain as on Figures 3, 5, and 7. The pose and design of this statue may be rude, but it is certainly equal, if not superior, to a vast majority of the ancient statues of Egypt. Every expression used in describing the pitted surface of Egyptian statuary has been employed by one author or another in describing celts or axes.

Ancient man in America was not possessed of iron or steel, nor of other hard metal, yet he fashioned discoidal stones, ceremonial weapons, animal pipes and figures with stone hammers, any of which required more delicate manipulation than did the Egyptian statuary of antiquity. Can it be claimed that the Egyptian was the inferior of the Indian in producing statuary, both being possessed of the same working tool? The bottom of the Homeric city of Troy was but thirty-three feet below the surface of the hill of Hissarlik. In this city bronze was found. Ten feet above was the surface of the burned city. Thus we may safely say that one thousand years before the Christian era man fashioned tools of bronze; that there were found also stone celts of beautiful shape and pestles of stone, both probably fashioned with the stone hammer. Twenty-nine feet deeper than the surface of this destroyed city, nearly on bed-rock, Schliemann found gold, lead, and copper that had been worked. Here also he found stone hammers by the thousand, celts, pestles, discoidal stones, and the Danish bored axe. All these articles required skill to manufacture, and in other countries in a like stage of development were contemporaneous with rude carving. Who can at present suggest the number of centuries that were required for the accretion at Hissarlik of twenty-nine feet of detritus? Who with our present knowledge would attempt to venture a suggestion as to the period of time that had elapsed prior to the founding of this lower city, since man first fashioned implements with a pecking hammer and rubbed them smooth, partly at least, with the same implement.

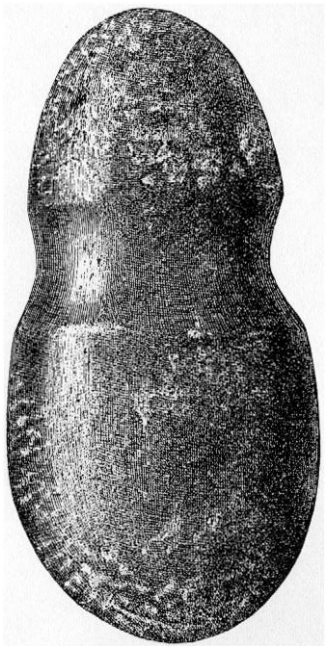
The contention in favor of the use of iron and steel or bronze in fashioning celts or statuary of diorite cannot be maintained. The stone hammer, in a part of the world at least, was used in shaping tools and figures of stone. Is it not a permissible inference that

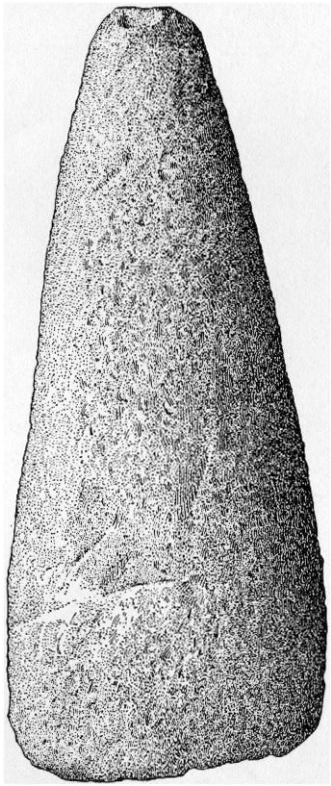
this was the carving tool, not only of the age of stone, but through it to that of bronze, and even to a later period, until iron came into comparatively common use? Then and then only would stone begin to be supplanted by the iron carving tool and sculpture show signs of advance; even then, however, first in the softer stones.

We may well imagine that the hammer first used for chipping would soon be employed for pecking the rudest implements. The latter in turn would be fashioned with more care, until in time it would become possible to shape the rude outlines of man and beast. The oft-advanced theories of softening the stones intended to be worked, of diamond drills, of hardened copper, of tempered steel, in the possession of the Peruvians or Egyptians, are not supported by facts, and must give way in favor of the tool all early races possessed, the hammer stone, which can readily be shown to do any work on stone implement or carving and to do it well and rapidly.

The views here set forth are supported by the experience of many years in the collection and study of implements, as well as by experiment. Whether or not they are accepted as sound, it is believed that an intelligent discussion of the subject by archæologists will advance our knowledge of man in the age of stone. The method of the manufacture of pecked implements has been declared to be one of the mysteries of archæology. It is hoped that the mystery is here at least partially solved.

FIG. 1—The pitted stone hammer.





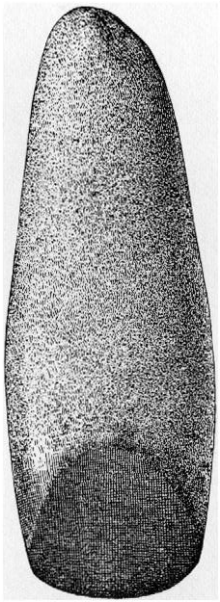
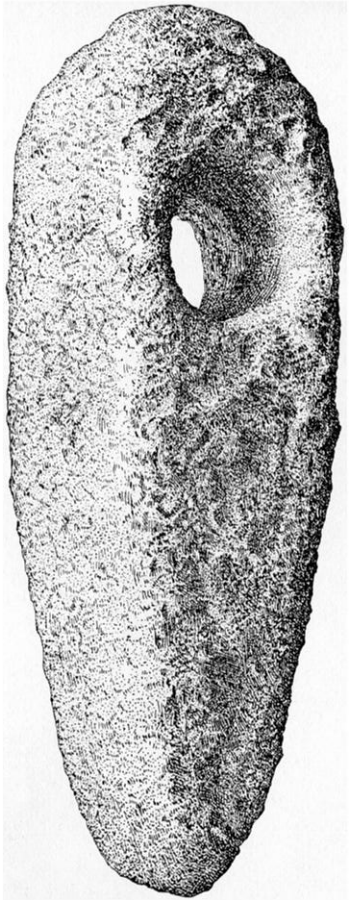


PLATE I.

FIG. 2.

FIG. 3.

FIG. 4.



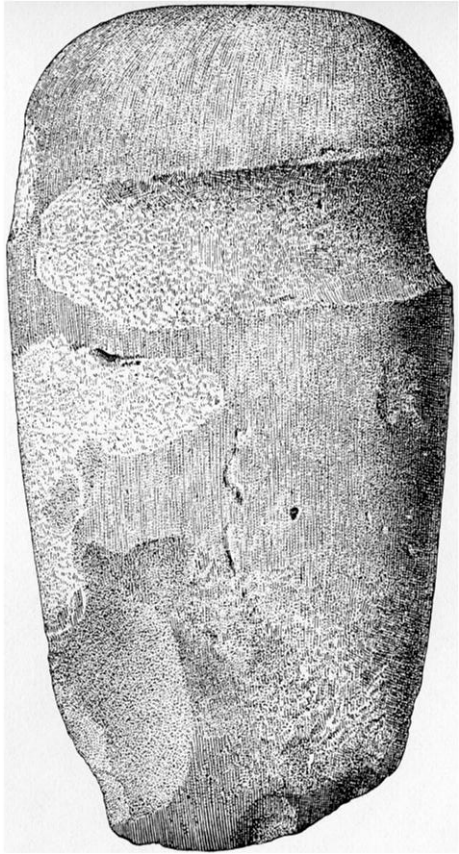


PLATE II. FIG. 5. FIG. 6. FIG. 7.